

1. Report No. SWUTC/01/167902-1		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle An Assessment of Options for Integrating Taxicabs into an Urban Environment				5. Report Date March 2001	
				6. Performing Organization Code	
7. Author(s) Ronald E. Goodwin and Carol A. Lewis				8. Performing Organization Report No. Research Report 167902	
9. Performing Organization Name and Address Center for Transportation Training and Research Texas Southern University 3100 Cleburne Avenue Houston, Texas 77004				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. 10727	
12. Sponsoring Agency Name and Address Southwest Region University Transportation Center Texas Transportation Institute The Texas A&M University System College Station, Texas 77843-3135				13. Type of Report and Period Covered	
				14. Sponsoring Agency Code	
15. Supplementary Notes Supported by general revenues from the State of Texas.					
16. Abstract Discussions surrounding the inclusion of taxicabs into the planning processes in urban areas have been ongoing since the oil crises of the 1970s. While there are some commonalties in the regulatory guidelines concerning taxicabs, most of the regulations vary from city to city. Such guidelines protect the public's safety and provide some consistency among the city's taxicab providers. In areas without public transit, taxicabs may be the only form of public transit available. The challenges facing many planners and public officials where there is a mix of public transit and taxicabs is the seamless integration of all available systems of transportation. When this integration is successful it creates a transportation network that reduces congestion and pollution, and ultimately improves regional mobility. This study examines the many ways taxicabs function in urban environments. The influences of the federal government and metropolitan planning organizations are critical for taxicabs to be successfully integrated into the urban transportation network. There are examples of taxicabs being subsidized by local governmental entities, and examples of unsubsidized situations. The principal focus will be to identify strategies for the inclusion of taxicabs in an urban environment. The city of Houston will serve as the specific model for local inclusion.					
17. Key Words Taxicabs, Jitneys, Public Transit, Urban Transportation			18. Distribution Statement No Restrictions. This document is available to the public through NTIS: National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161		
19. Security Classif.(of this report) Unclassified		20. Security Classif.(of this page) Unclassified		21. No. of Pages 51	22. Price

**AN ASSESSMENT OF OPTIONS FOR INTEGRATING TAXICABS
INTO AN URBAN ENVIRONMENT**

Ronald E. Goodwin

and

Dr. Carol A. Lewis

Research Report SWUTC/01/167902-1

**Southwest Region University Transportation Center
Center for Transportation Training and Research
Texas Southern University
3100 Cleburne
Houston, Texas 77004**

March 2001

ABSTRACT

Discussions surrounding the inclusion of taxicabs into the planning processes in urban areas have been ongoing since the oil crises of the 1970s. While there are some commonalities in the regulatory guidelines concerning taxicabs, most of the regulations vary from city to city. Such guidelines protect the public's safety and provide some consistency among the city's taxicab providers. In areas without public transit, taxicabs may be the only form of public transit available. The challenges facing many planners and public officials where there is a mix of public transit and taxicabs is the seamless integration of all available systems of transportation. When this integration is successful it creates a transportation network that reduces congestion and pollution, and ultimately improves regional mobility.

The presence of taxicabs in cities varies widely depending on several variables. Such variables include pedestrian facilities, favorable local legislation, and the public's perception of the taxicab industry. In many northern cities, taxicabs are a viable transportation alternative to the private auto. As such, taxicabs increase mobility options for those making specific trips where public transit may be too slow or not provide "door to door" service. In Houston, the taxicab industry languishes in the shadows of one of the country's most efficient all-bus transit systems. Additional local regulations restrict taxicabs to primarily serving destinations as the major airports, hotels, and shopping malls.

While there has been limited resurgence of taxicabs functioning as jitneys in some urban areas, the success of this service type has been limited to specific niche markets. These niche markets include rural areas, dense ethnic communities, and specific welfare to work programs. Officials recognize the importance of transportation in a successful transition from welfare to work. Many realize that traditional public transit may not completely provide the services needed. Therefore, the inclusion of all available forms of transportation, including taxicabs, becomes vital to provide the needed transportation services for all potential users.

This study examines the many ways taxicabs function in urban environments. The influences of the federal government and metropolitan planning organizations are critical for taxicabs to be successfully integrated into the urban transportation network. There are examples of taxicabs being subsidized by local governmental entities, and examples of unsubsidized situations. The principal focus will be to identify strategies for the inclusion of taxicabs in an urban environment. The city of Houston will serve as the specific model for local inclusion.

EXECUTIVE SUMMARY

This study examined the various strategies for the successful integration of taxicabs into an urban transportation network. The strategies include subsidized taxis (paratransit and jitneys), and unsubsidized transportation systems. Within the unsubsidized strategies taxicabs operate in a free market environment as any other business concern would with financial assistance from a governmental entity. This study also reviewed examples of taxicab systems in cities of with populations of less than 100,000 (small urban), 100,000 to 500,000 (medium urban), and more than 1 million (large urban).

The volume of literature about taxicabs and their potential urban uses reached a peak during the oil crises of the 1970s. However, urban planners and local officials in the last few decades have seemingly ignored the potential of taxicabs in reducing congestion and pollution. The resumption of new roadway projects imply that the new generation of engineers and planners have forgotten the gas-lines of the 1970s without an adequate contingency plan in the event of a massive shortage of fuel worldwide. In recent years different forms of rail systems attracted attention as a viable alternative to the auto in urban settings. However, the controversy surrounding urban rail may prevent its full potential from being realized. Still, even with the sparse literature discussing taxis and their use, the following is a summary of the available findings:

- Communities where inclusion of taxicabs occurred experienced improved local mobility;
- In the medium-sized urban areas, jitney-type services improved public transit coverage and service hours at a lower cost than would have ordinarily been possible;
- In the large urban areas, transit ridership increased through suburban feeder services and improved central business district (CBD) circulation. This resulted in a reduction of traffic congestion and air pollution;
- Transit patron's waiting tolerance for the next bus was about ten minutes;
- Integrated taxi services functioned well in areas with low-demand densities. Taxis provide transportation to smaller groups of individuals with better fuel efficiency than buses and will not contribute the same levels of pollution and congestion on local streets;
- Taxis provided services that were specifically designed to meet the special mobility needs of the elderly, handicapped, and low-income populations;
- Taxis supplemented public transit in the following ways: 1) providing extra peak-period capacity, 2) taking over services along transit routes at low demand times, and 3) extending services beyond the physical limits of existing routes;
- Taxis increased ridership to existing transit routes through feeder services from suburban communities to transit facilities (park & ride or transfer stations); and
- Taxis improved the mobility in CBD areas by functioning as a circulator system during morning, lunch, and evening peak hours.

Houston is a diverse community whose suburban development is consistent with other sunbelt cities. Since its inception in 1978, the Metropolitan Transit Authority of Harris County (Houston METRO) has provided public transit services through an all bus fleet. In 1998, Houston METRO operated 934 vehicles and purchased the transportation

services of another 569 vehicles (440 were demand responsive services and 129 were local bus services). Houston METRO's service area is about 1,200 square miles with annual revenue miles exceeding 48 million.

Given the previous general applications of taxicabs in urban areas, either subsidized or unsubsidized, this study specifically used Houston as a case study and identified the following strategies and their likelihood of success in such an urban setting:

1. Feeder and circulator strategies as *subsidized taxicab services* may find support in Houston. Feeder routes could serve communities outside the Houston METRO service area linking with existing transit facilities. This would provide seamless, coordinated transportation service with the many park & ride facilities and express bus routes currently operating throughout the region. Studies show that taxicabs operating along semi-fixed routes as a feeder or circulator can actually increase transit ridership in existing local services;
2. Taxicabs operating solely as a circulator system do not appear to be a viable option in Houston. Houston METRO currently operates an extensive network of trolleys in Houston's CBD and mid-town areas. CBD employees and visitors can park their cars at outlying parking lots and maneuver throughout the trolley service area very efficiently without more than an 8-10 minute delay. The addition of a network of circulator taxis would increase CBD congestion during morning and afternoon peak hours, while not providing any substantial gains in mobility;
3. The potential for an *organized free market option* appeared more promising than either the feeder or circulator subsidized system. This involves the establishment of a "taxi zone" by the city of Houston supporting increased taxicab activity in a specific area. Such a zone would have a base fare structure for trips originating and ending in the zone. For travel outside that zone, a different, consistent fare structure would apply. Local ordinances allowing shared rides would need to be examined to determine if such an arrangement would increase mobility. The support needed for the implementation of a taxi zone would come from local governmental entities and business organizations like the Greater Houston Partnership, transportation management organizations, and area civic groups.
4. The current *paratransit system* between Houston METRO and local taxicabs appears to be the most successful current use. This arrangement allows for the reimbursement of trips made by taxicabs on behalf of Houston METRO. This arrangement increases urban mobility to a particular segment of the population that is the most transit dependent. The individual taxicab owner operators still have the opportunity to provide other voucher services and free market trips.

TABLE OF CONTENTS

	Page
ABSTRACT	iii
EXECUTIVE SUMMARY	v
TABLE OF CONTENTS	vii
LIST OF TABLES	ix
DISCLAIMER	x
ACKNOWLEDGMENT	xi
INTRODUCTION	1
SUMMARY OF LITERATURE	5
METROPOLITAN PLANNING ORGANIZATIONS	7
FEDERAL GOVERNMENT	9
Urbanized Area Grants Program Central Business	9
Livable Communities.....	10
Job Access And Reverse Commute Program	10
Surface Transportation Program	11
Congestion Mitigation & Air Quality Improvement Program	11
INTEGRATED TAXICAB OPTIONS	13
Paratransit Systems.....	13
Jitneys.....	18
FREE MARKET SYSTEMS	23
Small Urban Area.....	26
Medium-Sized Urban Area	27
Large Urban Area	27
TAXICAB OPTIONS IN HOUSTON	29
General Applications.....	31
CONCLUSIONS	35
BIBLIOGRAPHY	39

LIST OF TABLES

Table	Page
1. Houston METRO's Performance Indicators	30

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the information presented herein. This document is disseminated under the sponsorship of the U.S. Department of Transportation University Transportation Centers Program, in the interest of information exchange. The U.S. Government assumes no liability for the contents or use thereof.

ACKNOWLEDGMENTS

This publication was developed as part of the University Transportation Centers Program, which is funded 50% with general revenue funds from the State of Texas.

INTRODUCTION

There have been several industrial developments that shaped the lives of every person in our nation's cities. The widespread use and availability of the telephone drastically improved personal communications. The development of the television introduced a new industry while bringing entertainment directly into the home. The end of the 20th century witnessed the explosion of the personal computer and its sidekick the Internet. Many analysts predict computers will eventually replace the telephone as the primary means of mass communications, and replace the television as the method of personal entertainment.

Perhaps the most significant urban development of this century is the automobile. Initially viewed as a toy for the rich and famous, Ford's development of the assembly line in the 1920s made the auto affordable to the working class. Practically overnight the auto improved urban mobility and closed the spatial gap between urban and rural communities. Since the 1920s many urbanists and sociologists documented the history of the auto and its social and economic effects on the city. The one aspect of the auto's history that receives sporadic attention is that of the taxicab industry. The near extinction of public transit in the 1960s and 1970s renewed interest in all forms of urban transportation. Since then urban officials have flirted with the idea of including the taxicab into the urban transportation network where no public transit exists or as an augmentation to established public transit services. Some metropolitan areas established pilot projects involving taxicabs and/or jitneys with varying degrees of success.

Community and transportation officials recognized decades ago that urban sprawl and low density residential development would have disastrous effects upon urban environments. Urban sprawl has also negatively impacted the services provided by public transit. In the 1970s public transit faced challenges of providing services in urban areas and in many small cities where the travel demand was too small to even support an efficient transit service at all. It became economically unfeasible to route and schedule bus transit services where there was little demand. Rail systems were too expensive and technologically unsuited for low volumes of demand. Bus services in low demand areas invariably only served those who were transit dependent. Public transit needed a means to respond to the needs of low-density developments economically and efficiently. This led to the introduction of flexible bus systems or dial-a-rides.

Initially, dial-a-ride systems using buses were seen as the answer in providing flexible urban transportation. However, it becomes clear that when examining institutional and operational difficulties those buses were not efficient in a flexible system. Officials then turned to taxicabs and found that they are better suited to respond to low density travel in urban environments.

Currently, taxicabs are a fixture in many paratransit systems across the country. Paratransit services are either provided by a local social service entity or the area transit authority. There is seldom any coordination between social service transportation providers and transit authorities on the best way to utilize taxicabs. The taxicab can be a

viable addition to the urban transportation network. However, planners and officials at all levels must show a commitment to their inclusion and should consider the following:

Federal initiatives like ISTEA, and its successor TEA-21, recognized that neighborhood and community public transportation services have been largely neglected in urban transportation planning. Traditional planning processes focused on major capital improvements such as building or redesigning roads and highways. ISTEA and TEA-21 support the use of transportation systems management to place greater emphasis on the efficient use of existing resources to enhance urban mobility.

Taxicabs should be a complement to mass transit, not a competitor. Traditionally urban transportation planners viewed the mass transit vehicle operating over a fixed route and fixed schedule as the only public transportation solution to all public transportation problems. However, it is now clear that taxicabs can and should be used as a complement to mass transit service. In many cities taxicabs provide elderly and handicapped transportation services, serve as a feeder system for regular transit routes. In Houston, taxicabs expanded existing transportation services during the oil embargoes of the 1970s. These are just a few of the examples that illustrate the potential uses of urban taxicabs.

SUMMARY OF LITERATURE

The literature governing taxicabs and urban mobility reached a peak in the 1970s. Urban planners and local officials in the last few decades seemingly ignored the potential of taxicabs and focused on establishing commuter/light rail and high occupancy lanes (HOVs)

The following are some of the findings from the existing literature:

- Communities where inclusion of taxicabs occurred found they benefited by the improvement in local mobility.
- In the small urban area, mobility increased for those without access to cars.
- In the medium-sized urban area, jitneys improved public transit coverage and service hours at lower cost than would have been possible with public transit techniques alone.
- In the large urban area, transit ridership increased through suburban feeder services and improved CBD circulation. This resulted in a reduction in traffic congestion and air pollution. In addition, the transit authority has been able to transfer some of the extreme peak demand for transit to jitneys and make more efficient all-day use of a smaller number of vehicles and drivers.
- A ten-minute wait for a transit vehicle appears to be the riders' limit of tolerance.
- Integrated taxicab services function well where there is low-demand densities and can efficiently transport a few riders at a time without high consumption of automotive fuels and without aggravating existing traffic congestion and air pollution.
- Provide the sole means of public transportation in small urban areas.

- Provide services that meet the special needs of the elderly, the handicapped and low-income residents of a given region.
- Supplement public transit by 1) providing extra peak-period capacity, 2) taking over services along transit routes at low-demand times, and 3) extending services beyond the limits of existing transit routes.
- Increase ridership of existing transit systems through feeder services from suburban communities to transit facilities (transfers station or park & ride lots)
- Provide limited mobility in high dense CBD areas through a circulator system.

METROPOLITAN PLANNING ORGANIZATIONS

Perhaps the most important function that a Metropolitan Planning Organization (MPO) or other urban transportation planning agency can undertake with regard to taxicabs is to provide a venue for coordination. An important part of cooperative transportation planning is the existence of mutual confidence and respect among the organizations involved. In the case of taxicab planning, the establishment of good relations between the taxicab industry, public transit agencies, local governments, and the general public is imperative for any kind of successful taxicab integration.

The first aspect of coordination involves an understanding of the entities to be coordinated. Transportation planners must inform themselves of the local taxicab industry, regulations, pertinent issues, and vehicle inventories. Another task in this regard is keeping abreast of what other urban areas are doing, what the status is of policies regarding federal grants and taxicabs, and what the findings are in the various ongoing taxicab demonstration projects. This is particularly important since it appears that many innovations in demand-responsive transportation yield unexpected results, both positive and negative.

Through TEA-21 the MPO is in a position to begin the incorporation of taxicabs into the regular transportation planning process almost immediately. Section 1203 (f) (C) allows MPOs to include accessibility and mobility options within their scope of planning processes. Additionally, TEA-21 provides several funding mechanisms for increased urban mobility. Among these are the FTA's metropolitan planning authorizations of

\$73.6 million per year for the six years of TEA-21. This is a total in excess of \$441 million that is available to MPOs for urban mobility programs.

Since there are few barriers to immediate taxicab inclusions, the community will see federal dollars at work instantly. Unlike freeways and transit guideways that generally require elaborate capital financing programs and a construction period of several years, changes in the taxicab systems can take place relatively quickly with little or no capital investment. The high flexibility and low capital nature of the taxicab industry is perfectly suited for short-range, policy-oriented planning. However, this should not exclude taxicabs from being a significant part of the long range planning processes. Future issues concerning local regulations, federal subsidization, and suburban mobility are issues the MPO will need to address.

FEDERAL GOVERNMENT

There have been several studies examining the role of the federal government in this nation's public transit services. That role has traditionally been financial in the form of subsidies and funds for capital improvement projects. However, the federal government does provide grants to social service entities to support local/regional paratransit services.

The Department of Transportation (DOT) initiated several programs to aid states and MPOs in addressing local transportation needs. Strategies to include taxicabs in the urban network can be funded through these programs. The following are a few of the DOT programs available to MPOs.

Urbanized Area Formula Grants Program

The Urbanized Area Formula Grant Programs are sponsored by the DOT and FTA and provides funding for transit capital projects and assistance for some operating expenses. The urban area must have a population in excess of 50,000 as the funds are apportioned using a formula based on the following: population, population density, existing transit service, and transit ridership. All publicly and privately owned transportation agencies are eligible to apply. Taxicabs benefit from this program as qualified projects include those that help communities reduce traffic congestion. In terms of available funding, in fiscal year 1999 the DOT set aside \$2.5 billion and proposed \$2.9 billion for fiscal year 2000.

Livable Communities

The DOT and FTA are the sponsoring agencies for this initiative. This program helps communities get involved in planning and designing transit systems that are customer-friendly, community-oriented and well designed. Those eligible to receive funds under this program include transit operators, MPOs, city and county government, planning agencies. Any other public bodies with the authority to plan and/or construct transit services are also eligible to apply. Non profit organizations are not allowed to apply directly for assistance, but may participate as partners with one or two of the eligible entities. The DOT and FTA provide a list of eligible projects and they include:

- Planning pedestrian walkways and transit-oriented development;
- Assessing environmental, social, economic, land use and urban design impacts of projects;
- Studying the feasibility of transit projects;
- Providing technical assistance;
- Funding participation by community organizations and the business community, including small and minority-owned businesses and persons with disabilities; and
- Evaluating best practices and developing innovative urban design, land use, and zoning practices.

Job Access and Reverse Commute Program

The Job Access and Reverse Commute Program provides funding for the development of new or expanded transportation services that connect welfare recipients and other low-income persons to jobs throughout a given area. Those eligible to apply for funds under

this program are state and local governments, MPOs, public transit agencies, tribal organizations, and non-profit organizations. The sponsoring agencies fund projects such as shuttles, vanpools, and guaranteed ride home programs. Reverse commute projects are limited to those that provide transportation services to and from suburban employment centers.

Surface Transportation Program (STP)

The DOT and Federal Highway Administration (FHWA) are the sponsoring agencies for this program. The STP is a flexible funding mechanism that state and local governments can use on any federal-aid highway, including the National Highway System, bridge projects on any public road, transit capital projects, and public bus terminals and facilities. A portion of funds reserved for rural areas may be spent on rural minor collectors. Local entities can apply for this program only through their state DOTs. This program is limited to state transportation agencies only. A total of \$33.3 billion is available for the fiscal years 1999 to 2003.

Congestion Mitigation and Air Quality Improvement Program (CMAQ)

This program funds projects in areas that do not meet the National Ambient Air Quality Standards (non-attainment areas) and former non-attainment areas that are now in compliance (maintenance areas) for ozone, carbon monoxide, and small particulate matter. Funding helps these areas meet the requirements of the Clean Air Act. The DOT and FHWA sponsor this program and limit eligibility to state DOTs and MPOs. Eligible projects include those that will reduce transportation-related emissions, such as transit

improvements, travel demand management strategies, traffic flow improvements, and public fleet conversions to cleaner fuels. Funding is available to those areas based on a formula that considers population by county and the severity of air quality problems.

INTEGRATED TAXICAB OPTIONS

The literature concerning taxicabs since the late 1960s discuss two primary options for the integration of taxicabs in urban areas, either as subsidized or unsubsidized (free market) systems. Subsidized strategies include taxicabs operating in paratransit systems or functioning as a jitney. The subsidies can come from a variety of sources such as the local transit agencies, local government (city or county), or the area MPO. While the free market option relies solely upon the ability of the taxicab operations to provide an attractive transportation alternative, they still require favorable local ordinances and clearly defined guidelines to protect themselves and the consumers. The following examples detail the experiences of subsidized and unsubsidized taxicabs in an urban environment of varying sizes.

Paratransit Systems

There are many examples of paratransit systems nationwide. The following example shows the establishment of paratransit services in a single county in California and is fairly representative of the examples found throughout the paratransit literature. Even though these examples are from the late 1970s, they illustrate how important commitment and cooperation are to the successful initiation of taxicabs as a paratransit service.

In Chico, California, the city council received pressure from local groups to establish some form of public transit system. Believing there was not enough potential ridership for a traditional transit service, the city council began examining paratransit-type services. Even though funds were available for a paratransit system, every dollar used for public transit meant less money would be available for the construction or repair of area

streets and highways. At this time surface transportation projects, streets and highways, were the highest transportation priority of local officials. Accordingly, the planning staff at the county and state levels found themselves under pressure to develop the most cost-effective service possible.

The two most important aspects of system organization were shared ride operations and compensation of the paratransit provider on a consumed service basis. The compensation aspect was accomplished by paying the provider a fixed fee per ticket collected from the riders. The ticket system also made it easy to limit eligibility to the elderly and handicapped and eliminated the problem of the operator handling (and possibly mishandling) cash. It was also decided that the provider should supply the vehicles for the system, at least initially, which would allow the services to begin immediately.

These principle features of the system's organization, shared ride and available vehicles clearly were most compatible with the operation of a local taxi company. Not surprisingly, a local taxi company submitted the winning bid. The operator agreed to \$1.95 per ticket collected and up to three individuals could ride on one ticket.

Soon after the service began it became evident that the paratransit service would be successful. Ridership increased steadily, patrons were satisfied with the level of service, and costs were reasonable due to the use of the fixed fee per ticket scheme. Accordingly, other cities in Butte County, none of whom had any public transit service at this time, also became interested in local paratransit services.

The opportunity to become a publicly subsidized paratransit contractor was quite welcome for the contractor in the cities of Chico and Paradise. The contractor's ambulance and taxi businesses were not particularly profitable. Within a few months of starting paratransit service the contractor sold the taxi company, recognizing that there was much more money in transit contract operations than in regular taxi service. The initiation of the subsidized elderly and handicapped services severely reduced the city's already meager taxi market.

The poor economic prospects of taxi service in Chico resulted in the taxi service being sold and purchased several times. Demand became so low that operating a profitable taxicab business seemed impossible. The existence of the taxicab service in Chico became important to the paratransit service provider and City leaders since taxicabs operated 24 hours a day and the paratransit service only operated 10 hours a day.

The City of Paradise, also in Butte County, prodded by its senior citizen community, was the next to take the plunge into elderly and handicapped transportation services. In mid-1977 the County solicited bids on the Paradise paratransit system. In contrast to the Chico situation, however, the Paradise Taxi Company did not want to bid on the service. The owner decided it was in their best interest to avoid all partnership agreements with all levels of government or a subsidized service. Additionally, the owner openly opposed any and all attempts to initiate any form of public transit in Paradise. Once it became clear that the local taxis would not participate in the system, the paratransit provider from

Chico expressed his desire to duplicate the service in Paradise. Within a few months the City awarded him a second paratransit contract.

The City of Oroville was also interested in public transit; however, they were the most hesitant of the three cities to start a new service. The poorest of the three communities and the home of most of the county's lower income residents, Oroville was concerned that it might become involved in a service that turned out not to be cost-effective and then be unable to extricate itself. The director of the CALTRANS office, who was an advocate of public transit for the Butte County cities, came up with a solution. Butte County and the City of Oroville agreed to apply for a state grant for a transit demonstration project.

The grant program was administered by CALTRANS, so obtaining approval was not difficult given the strong support of the local CALTRANS office. The advantage to Oroville was two-fold. First, the grant period was for at most a year, thus giving the City an easy way to drop the paratransit service if it proved too costly or otherwise unsuccessful. Second, during the grant period the state paid most of the cost of the program, allowing the City to experiment with only a small amount of available funds. The Oroville City Council accepted the merits of a paratransit service designed primarily for the elderly and handicapped on this basis.

Because of the taxi involvement in Chico and Paradise, there was a strong presumption that the local taxi company would be the contractor, and local officials even invited its management to accompany them on a trip to Southern California to investigate several

similarly designed paratransit systems. While there was a formal award process for the contract, the organizational parameters--consumed service compensation and the use of the provider's own vehicles, in particular--all but preordained the choice. As the Yellow Cab Company was the only taxi company operating in Oroville, the City selected the company as the provider with a bid of \$1.75 per ticket.

The owner of the Yellow Cab also owns Oroville's only transit company, Oroville Bus Lines. This bus service only operates on a contract basis, providing transportation services for the handicapped school children of Butte County, fire fighters, and a limited local fixed route service.

In order to reduce expenses, the paratransit services and the unsubsidized Yellow Cab taxi operations share management, employees, and facilities. By keeping regular taxi fares low, and streamlining the management of personnel and equipment resources, the contractor is able to realize operation efficiency in both operations. Some of this operational efficiency stems from using family members as management and office staff, which means that people do the work with a direct economic stake in the well being of the company.

The taxi drivers are also pressed to be as efficient as possible, in particular to deliver speedy service. This has led to complaints from some of the users of the elderly and handicapped services, who expect more personalized service. The contractor resisted these demands, and insisted that his drivers be compensated by patrons for such services

as carrying grocery bags to the door. In his view, highly responsive service--which means low wait and ride times--is the real measure of level of service to the user.

Jitneys

Extended forms of taxi/jitney service cover a spectrum of public transportation alternatives that range from traditional individualized taxi service to fixed route type service. Jitneys characteristically provide specialized transportation services for small groups of riders. Its great advantage over public transit in this regard is that the services can be designed to meet the specific needs of these groups. Services can be designed to serve selected socio-economic groups such as residents of a low-income neighborhood, or provide a specific type of service to a broader group of users, such as feeder service to mass transit systems.

Jitneys typically operate along fixed routes stopping to pick up and drop off passengers only upon request. Jitneys may stop in the middle of a block in answer to a hail, but more regularly they take on and let off riders at designated curb zones near intersections. In order to operate profitably, jitney operators usually limit service to high density travel corridors, although it is possible for them to provide fixed-route service to a major facility, such as a shopping center, at some distance from the nearest residential or commercial area.

In addition to paratransit services already discussed, taxicabs as jitneys also provide an inexpensive alternative to public transit, in some rural areas, or the use of private vehicles

in five important market areas. Jitneys can provide the sole means of public transportation in rural and some small urban areas when population size and density are not sufficient to support traditional public transit. Jitneys can operate more economically than buses at low-demand commuting times, such as the evening hours, as their capacity is ideal for small passenger loads. Continuation of service over these periods is of special benefit to those in the community who rely entirely on public transit, and the transit authority may choose to contract for the jitney operation as an alternative to serving the routes with buses.

Jitney services are capable of performing an essential role in promoting overall ridership of an integrated transit system. Jitneys are especially suited to providing feeder services to regional rail transit and express bus systems, and can relieve some of the peak-period demands on transit facilities along major travel corridors. However, studies show that jitney services designed to compete with existing public transit services can attract riders from line-haul routes. This is especially true in lower density areas where existing mass transit service is already poor.

Still, when routed along parallel streets during the peak hours, jitneys serve not only to improve access to public transportation, but also would reduce the number of transit vehicles and personnel required to meet the intense demands of these short periods. The economies derived from more extensive utilization of a smaller fleet might be such that the transit authority could subsidize the peak-period operation of jitneys for commuter transportation.

Another important feature of jitney services is that several different services, each designed to serve a particular market, can be offered simultaneously by a taxi company within a single integrated operation. In fact, a well-planned, multi-faceted system offers the best potential for optimum utilization of labor force and equipment. One type of service may be directed toward commuters, with a complementary service making use of the same resources during off-peak hours.

The use of readily available passenger cars and vans, which permits immediate implementation of new systems at relatively low capital investment is one of the attractive characteristics of jitney services. Even though some form of dispatching system is essential to the operation of the demand-responsive types of jitney services, the taxicab company, where economically feasible, should use its existing capability to serve both the original taxi operation and new jitney services. However, since most jitneys operate on fixed route services, they have no need for the complex dispatching systems of taxi operations.

Riders of jitneys are not easily categorized. In Latin American countries, the jitney is a familiar and more comfortable mode of travel than public transit. While in Atlantic City ridership is largely made up of tourists who find they can travel more easily by jitney than with their own cars because of the shortage of convenient parking spaces. Another large segment of Atlantic City users is made up of school children, which can purchase books of reduced-fare tickets at their schools.

Taxis and jitneys are commonly regulated at the local level, and most existing city ordinances prohibit both shared-use of taxi vehicles and all jitney operations. The private operator will need to determine what the local regulations are in each specific area.

The literature indicates that taxicabs operating along semi-fixed routes have definite applicability in a wide range of urban settings. The following is an example of findings from such services in cities of varying sizes, illustrating how coordination and commitment at all levels can enhance mobility in conjunction with existing public transit. In some small urban or rural communities there are strategies that will allow these services to operate as the sole means of public transportation.

FREE MARKET SYSTEM

In a free market environment individual taxicabs compete with one another for riders. Local governing bodies do not subsidize any portion of the potential trip, or limit the number of taxicabs serving a particular area. However, local ordinances allow for shared-ride taxi services, as long as all of the passengers give their consent. Furthermore, regulations should provide guidance on various service-related issues such as 1) maximum number of hours a taxicab driver can work, 2) the number of operational hours, of days per week, of taxicab vehicles and 3) the type of taxicab operation (fleet, lease, or owner operated).

Local jurisdictions regulate the fare structure for taxicab operations. The basis for most fare structure are the metered systems or the zone fare system. With the metered system the fares include an initial fee for the first increment of distance traveled and additional fees for each extra mile. In the fare zone system, there is a clearly defined service area with specific charges for trips that originate and end within one zone, or between two zones.

In the early 1980s the New York City Planning Department studied the urban effects of express and local feeder for-hire taxis on local mobility (many of these taxis used 12-15 passenger vans). Additionally, they wanted to determine the operational, legal, and economic effects and establish City policy that would maximize the benefits while simultaneously decreasing the negative effects. It was assumed that competition between

the taxicabs and subsidized transit through normal market responses would improve mobility throughout the city. There was also the assumption that an efficient free market transportation alternative would reduce the need for expensive subsidized transit.

The study identified two types of van services being offered. The first was an express service into and out of the Manhattan CBD. The other was a feeder service to outlying New York City Transit Authority (NYCTA) transit stations. Both services were most widely used during the morning peak hours. The study estimated the total combined daily ridership to be somewhere near 10,000 passengers to and from Manhattan. Another 5,000 daily combined passengers were from the suburban areas.

Most of the express vans operated in direct competition to NYCTA express buses or the subway. Seventy-five percent of all van passengers began or ended their trip in Manhattan's four outer boroughs (Bronx, Brooklyn, Queens, or Staten Island). Only 16 percent of the riders were from Westchester and Upstate New York, seven percent from New Jersey, and only two percent from Connecticut. There were over 500 trips in the morning peak hour compared to just over 480 in the afternoon peak hours.

The local feeder service charged the same fare as the subsidized bus services, but provided services into areas where NYCTA did not have regular transit services. The feeder services linked high-density areas like Brighton Beach and Sheepshead Bay with the nearest NYCTA transit station. The study found that these van actually increased ridership at the NYCTA's transit stations.

The study found that the van systems, both the feeder and express routes, increased congestion in the corridors they operated in. The congestion in lower and midtown Manhattan became especially serious as van competed for the limited curb and street space. Many of the van operators illegally used bus lanes adding to the congestion of over 100 buses that legally operate in these designated lanes. Some vans load and unload passengers from the street side and prevent unhindered access to many of the City's bus stops. During the period of the study, the city estimated lost revenues to NYCTA to be in excess of \$8.5 million annually.

The study also found that van operators sincerely believed that they provided needed transportation services. Most van passengers interviewed thought the vans were an improvement over the subsidized transit services (over 95 percent of those surveyed were former transit riders). NYCTA published its own report estimating that over \$30-\$50 million in lost revenues annually from the van services. Some city officials supported the van services as a mean to increased mobility in congested corridors. While other argue that the vans consume valuable street space. Enforcement of the city's licensing procedures was sporadic and ineffective.

The study's recommendations focused on licensing, enforcement, and street use guidelines. It was generally agreed that the taxi services provided needed increased urban mobility options, even though they reduced NYCTA's overall revenues because of the direct competition in certain corridors. Still, the proliferation of uncontrolled,

unlicensed and unregulated vans negatively affected transit operations and traffic congestion. Organized and controlled taxi services would complement existing subsidized transit services by increasing mobility in areas with poor accessibility and inadequate transit services.

It was unclear whether some, all, or none of the taxi services identified in the study operated along fixed, or semi fixed routes. It can be assumed from the very nature of feeder and local services that there was some type of fixed schedule, in terms of time and/or route. The taxi services exposed many of the deficiencies in NYCTA's transit services. These deficiencies were slow and/or overcrowded buses, limited subway coverage, and few mechanisms to ensure passenger safety.

Small Urban Area, Population less than 100,000

This is a community where residential densities are possibly too low to support traditional public transit. However, the taxicab businesses, with assistance from local governmental entities, can increase area mobility by initiating the following strategies:

- Establish a dial-a-ride and/or jitney service during the traditional work hours (7a to 6p) that is subsidized by local governmental entities.
- Encourage the existing taxicab businesses to increase its hours of operation to 24-hour service, seven days a week.
- Establish subscription commuter services for night-shift workers. This service should be free to the employees and subsidized by the employer.

Medium-Size Urban Area, Population between 100,000 and 500,000

In most medium sized urban areas some form of public transit exists, even if it is just a limited service. This will allow a taxicab company to supplement the existing transit services by considering the following strategies:

- Establish a jitney service as 1) an internal CBD circulator and 2) a feeder service to main line buses. The local government and/or the transit agency provide the subsidy.
- Use jitneys along bus routes during hours of low ridership. The transit authority subsidizes this service.
- Enhance current taxicab operations with the local government providing some form of subsidy for low-income residents. The subsidy could be in the form of reduced tickets sold through social service agencies.

Large Urban Area, Population greater than 1,000,000

In this urban setting there is an established central city typically with an extensive public transit network. Public transit resources usually include buses and in some communities some form of commuter rail. The literature illustrates that the integration of taxicabs in this setting requires the highest levels of cooperation. The following are strategies that would allow the inclusion of jitneys to supplement existing established transit services. Both options could be subsidized by the transit agency in coordination with local governments.

- Establish subscription taxicab, dial-a-ride, or jitney services for suburban communities to provide internal circulation and as a feeder service to express bus routes. The transit agency and local governments provide some form of subsidy.
- Establish jitney services along streets parallel to those used by buses to reduce traffic congestion during peak commuting hours.

TAXICABS OPTIONS IN HOUSTON

Houston is a diverse community whose suburban development is consistent with other sunbelt cities. The Metropolitan Transit Authority of Harris County (Houston METRO) provide public transit services through an all bus fleet since its inception in 1978. There have been discussion of including some form of a rail component since the early 1980s and recently Houston METRO identified one of the most congested inner city corridors for the first leg of a new modern light rail system.

Houston METRO serves an area of over 1200 square miles with annual passenger miles of over 533 million miles with annual revenue miles exceeding 48 million. In 1998, Houston METRO operated 934 vehicles in bus operations and purchased another 569 vehicles (440 in demand responsive services and 129 in bus services). Houston METRO does not operate any vehicles in a demand responsive capacity. The following tables illustrate Houston METRO's performance indicators as measured by the Federal Transit Administration's (FTA) 1998 National Transit Databases:

Table 1. Houston METRO's Performance Indicators

Performance Measures	Bus	Demand Responsive
Operating Expense/Vehicle Revenue Mile	\$4.91	\$1.55
Operating Expense/Vehicle Revenue Hour	\$70.89	\$32.29
Operating Expense/Passenger Mile	\$0.37	\$1.32
Operating Expense/Unlinked Passenger Mile	\$2.04	\$13.81
Unlinked Passenger Trips/Vehicle Revenue Mile	2.41	.11
Unlinked Passenger Trips/Vehicle revenue Hour	34.83	2.34

Source: Federal Transit Administration, 1998.

The Greater Houston Area Chapter of the American Red Cross provides non-emergency transportation services for individuals who have no other transportation options. The Red Cross also contracts transportation services for wide variety of health and human services agencies. Before 1993 the Red Cross' transportation services were strictly voluntary. The decision to expand the transportation service provided arose from the needs of Red Cross' client base. Up to 20 percent of the trips made by the Red Cross are through volunteers, the rest are financed through contracts or state/federal grants. These services are not designed to compete with existing Houston METRO local routes. The Red Cross' unofficial transportation philosophy is that "if someone can ride the bus, get on the bus."

The relationship between the local taxicab companies and the Red Cross arose out of the need for additional transportation vehicles. When the demand for transportation services exceeds the Red Cross' capabilities, they contact one of the taxicab companies they have contractual agreements with. The information for a particular trip is faxed to the taxicab

company and they dispatch one of their drivers to the location. The patron incurs no cost as the taxicab company forwards an invoice to the Red Cross on a periodic basis.

The major challenge to this arrangement involves the availability of taxicabs to respond to the Red Cross' request. There appears to be no real incentive for coordination on the part of the taxicab companies. Red Cross officials admit that many of their requests have not been answered by the taxicab companies in a timely manner.

Houston METRO also contracts with taxicab companies in providing paratransit services. Houston METRO provides its customers with vouchers to use with contracted taxicabs. Houston METRO pays the first \$8 of any given trip, while anything over \$9 is the responsibility of the customer. Taxicab officials generally like the voucher system and state that this is also beneficial to Houston METRO as their paratransit services generally cost about \$35 per person while taxicabs provide incur only \$18 dollars per person. This particular taxicab official has had a contract with Houston METRO since 1982 and typically provides 9,000 trips monthly under the voucher program.

General Applications

Given the previous general applications of taxicabs in urban areas, either subsidized or unsubsidized, the following discuss each application in Houston and its likelihood of success.

The feeder and circulator strategies are subsidized taxicab services that may find support in Houston. Houston METRO operates 41 transit facilities throughout its service area. Feeder routes could service communities outside the Houston METRO service area through the transit facilities, thus providing seamless coordinated transportation service with the many park & ride and express routes currently operating. Studies have shown that taxicabs operating along semi-fixed routes, similar to that of jitneys, can actually increase transit ridership in existing transit services.

Houston METRO sponsored a limited jitney project that lasted only two years. From this brief experience there were a few findings that indicate the future of semi-fixed routes, and the integration of taxicabs in a subsidized form. The jitney route operated along the one of the busiest corridors in Houston and in competition to the local route with the highest ridership. This jitney served primarily minority patrons and made connections to a park & ride facility. The failure of the jitney services may not have been due to a lack of ridership support, but the nature of the administrative structure. After extensive political maneuvering, the Houston City Council allowed jitneys to operate legally in Houston after almost 70 years. However, any jitney service had to be under the auspices of Houston METRO. Therefore, the subsidy to the jitney contractor came from Houston METRO, not the city of Houston or the Houston Galveston Area Council (HGAC), the local metropolitan planning organization (MPO). The fixed route service began under intense local media attention, and ended virtually unnoticed by the public.

Therefore, coordination is key for any type of subsidized feeder system to be successful. It is also critical that the feeder system(s) compliment rather than compete with Houston METRO's established routes. The taxicabs would be given specific times and zones of daily operations and area communities would further be able to personalize the taxicabs serves in their communities. The specific guidelines for the feeder services could be established by HGAC with input from its member communities.

The other subsidized option, a taxi circulator route, does not appear to be viable in Houston. Houston METRO operates an extensive network of trolleys in Houston's CBD and midtown areas. CBD employees and visitors can park their vehicles at distant facilities and maneuver around the trolley service area very efficiently without more than an 8-10 minutes delay. A network of circulator taxicabs would only increase congestion and not provide any substantial gains in urban mobility.

The potential for an organized free market option appears more promising than either the feeder or circulator subsidized systems. The establishment of a "taxi zone" by the city of Houston would foster increased taxicab activity in a specific area. Such a zone would have a base fare structure for trips originating and ending in the zone. For trips that would require travel outside of the zone, a different, consistent fare structure would apply. Local ordinances allowing shared rides would need to be examined to determine if such an arrangement would increase local mobility. The support for a "taxi zone" would need to come from local governmental entities and other business organizations

like the Greater Houston Partnership, transportation management organizations and possible area civic groups.

The current paratransit system between Houston METRO and the local taxicabs appears to be the most successful current use. This arrangement increases urban mobility to a particular segment of the population that is the most transit dependent. The effects of the taxicab companies are also minimal as the general operation is not consumed by contractual obligation to Houston METRO. The individual taxicab owner operators still have the opportunity to provide voucher services and free market trips.

CONCLUSIONS

City and transportation officials have sought to integrate taxicabs into an urban transportation network for decades. In many cities taxicabs augment existing public transit services with varying degrees of success. The guidelines that regulate urban taxicabs protect the public's safety while providing consistency among the many taxicab companies licensed to operate. In areas without public transit, those classified as rural or non-urban, taxicabs may be the only form of public transportation available. The challenge in the urban environments that have public transit services and taxicab companies is to seamlessly integrate all available systems of transportation into a viable network. The long-term objective would be the reduction of congestion and improved regional mobility.

The national resurgence of the jitney as a form of urban transportation in niche markets provides only limited opportunities for the taxicab industry. Such niche markets include rural residents, new immigrants in dense communities, and participants of local welfare to work programs may not be sufficient to justify the existence of a semi-fixed route transportation service. However, government officials recognize the importance of transportation to welfare recipients in accessing employment, and further acknowledge that public transit may not completely provide the needed services.

Most recently, in cities like Houston, taxicabs have had measurable successes in providing paratransit transportation. In this manner, they operate on an as-need basis with a customer base that schedules their use either hours or days in advance. As such,

their function would be similar to that of the “traditional” service offered by taxicabs, except for the advanced scheduling.

The coordination between Houston METRO and local taxicabs is one that needs further evaluation. However, given the longevity of the relationship, it seems to be very successful. The elderly and handicapped are a special segment of the population whose transportation needs have recently received much needed attention. The Americans with Disabilities Act removed the physical barriers in accessing normal bus services. However, many individuals still cannot use those services some a variety of physical reasons. As such Houston METRO’s paratransit services will continue to play a major role in providing mobility. In 1998 Houston METRO purchased the transportation services of 440 vehicles from other transportation providers, including taxicabs. This is more cost effective than actually purchasing 440 vehicles for inclusion into Houston METRO’s fleet of vehicles.

The use of taxicabs as a feeder system would only be successful if the surrounding communities would support it. Many of Houston METRO’s numerous park & ride facilities extend to the outer limits of their service area and provide comfortable access to the CBD via express and commuter routes. There may not be a sufficient ridership demand for a subsidized fixed, or semi-fixed, route feeder service from non-urban communities to Houston METRO’s transit facilities. A pilot program supported by HGAC would be the best way to determine if such a ridership demand does exist without a major monetary investment.

A subsidized taxicab circulator system does not appear feasible given Houston METRO's extensive network of trolleys in the CBD and midtown areas. The result would be increased congestion and direct competition with Houston METRO. One of the most important considerations in any integrated taxicab options that should be avoided is direct competition with existing public transit services.

The establishment of a "taxi zone" would encourage increased taxicab activity in a specific area like Houston's CBD and along dedicated congested corridors. Local ordinances inviting transit patrons to consider taxicabs as a transportation option for limited trips would need to be examined to determine if such an arrangement would increase local mobility. Not only would a specific "taxi zone" be identified, but perhaps dedicated hours during the workday as well.

Nevertheless, grassroots support for increased taxicab integration might influence local governmental officials that options for increased mobility already exist in the form of those yellow vehicles traversing Houston's city streets. The efforts for coordination must include all governmental entities, the public transit agencies, and civic and business groups. Through Federal initiatives and legislation communities have the ability to develop mobility programs that decrease congestion, improve mobility and improve the environment. Those yellow vehicles may be the answer.

BIBLIOGRAPHY

- Boarnet, Marlon G. and Nicholas S. Compin “*Transit-Oriented Development in San Diego County: Incrementally Implementing a Comprehensive Idea*”, The University of California Transportation Center @ U.S.C., (June 1996)
- Cervero, Robert, Timothy Rood and Bruce Appleyard “*Job Accessibility as a Performance Indicator: An Analysis of Trends and Their Social Policy Implications in the San Francisco Bay Area*”, The University of California Transportation Center @ U.S.C., (April 1995)
- Round, Alfred and Robert Cervero “*Future Ride: Adapting New Technologies to Paratransit in the United States*”, The University of California Transportation Center @ U.S.C., (January 1996)
- U.S. Department of Transportation, “Taxicabs as Public Transit”, September 1980.
- U.S. Department of Transportation, “Taxicab Regulation in U.S. Cities”, October 1983.
- U.S. Department of Transportation, “Financing and Sustaining Mobility Programs in Rural Areas”, August 1986.